

ELEMENT 5: DESIGN AND PERFORMANCE PROVISIONS

Design Guidelines

The City utilizes the Design Guidelines for Sanitary Sewer (“Guidelines”) for establishing minimum standards for construction of public sanitary sewers. This document was prepared by City staff in 1991. These guidelines are intended to aid consulting engineers, developers, and others doing work in the City on public sanitary sewer projects. A copy of the Guidelines is included in Appendix A.

The Guidelines describe the calculation for peak flow rate; design flow depth and minimum slope; pipe material, soil cover, minimum spacing/clearance and sizing for laterals mains and manholes; sewer connection; site planning; and required submittals.

The Guidelines have adequately provided minimum design standards of City’s sewer projects. City staff plans to update the Guidelines and recommend adoption by City Council for incorporation as City Policy in the near future.

The Guidelines do not include the design standards for pump station or force main, and pump station and force main designs. These types of facilities are typically designed by outside engineering consultants.

Sanitary Sewer Design Procedures

The first edition Sanitary Sewer Design Procedures (In-House) manual was prepared in 1991. Since then, the Design Procedures have been followed by City staff for in-house and consultant designed projects.

The Design Procedures incorporate the previously mentioned Guidelines, in addition to outlining project management procedures to deliver a project from initial scoping to the award of contract. The additional procedures include:

- ***Preliminary Engineering*** includes planning; scheduling; budgeting; requesting for services or information from utilities companies, material testing, survey, and transportation departments; hydraulic analysis; preliminary design; and environmental clearance applications such as exemption, negative declaration, and/or EIR
- ***Initial Design and Plan Check Distribution*** for review to utility companies, impacted agencies, and involved departments and divisions including material testing lab, survey, transportation, sewer maintenance, and construction, and other CIP groups within the Sanitary Sewer Section for peer review
- ***Final Design*** includes property acquisition, request for insurance specification, request for encroachment permits, construction quantities and cost estimates, preparation of final plans and specifications, final review and approval, and bid and award

The Procedures ensures the communication, coordination, and collaboration with the involved parties in the design review process. The Design Procedures is included in the Appendix.

Siphon Design

In 1991, the Study of the City Sanitary Sewer Siphons was prepared by City's Sewer Engineering Section of Department of Streets and Traffic (or Transportation). The study describes the procedures, analysis and recommendations for maintenance. The study also identifies guidelines for siphon design that have been used by City project engineers for review and design of siphons. A copy of the Study is available in the Appendix.

Sewer Level of Service Policy

In June 1982, City Council adopted a Sanitary Sewer Level of Service Policy ("Policy"). The primary purpose of the Policy is to ensure that the City will not have sewage spills due to insufficient capacity in the collection system; and that there is adequate capacity in existing sewer mains before development occurs which could comprise the ability of the system.

There are six levels of service (LOS) that are used to determine under what conditions new developments are allowed to connect to the existing sewer system. The LOS are defined based on comparison of flows to existing sewer capacity. However, there are ambiguities in the definitions of the LOS in the 1982 Policy, as well as inconsistencies with the City's Sewer Design Guidelines.

A copy of the 1982 Sanitary Sewer Level of Service Policy can be found in the appendix.

Other Design Standards Used

When a trenchless technique or a lining system for pipelines is used to rehabilitate an existing system, the design conforms to ASTM and appropriate industry standards. Some of the trenchless techniques used by the City for rehabilitation are:

- Cured-in-Place Pipe Lining
- Sliplining
- Fold and Form Lining
- Spirally Wound Pipe Lining
- Directional Drilling
- Pipe Bursting
- Micro-Tunneling

The engineering analysis during design phase includes factors such as pipe size, length, and depth; existing pipe condition; capacity requirement; access conditions; right-of-way requirements; soil condition and cover; groundwater conditions; project locations; traffic conditions; environmental impacts; etc.

ASTM and other industry standards are also used for the design of manhole rehabilitation with lining method. City has specified the following lining methods in the Special Provisions for various manhole rehabilitation projects:

- Cementitious Liner with Corrosion Protection Epoxy Coating
- Cementitious Liner with Calcium Aluminate Mortar
- Epoxy Lining
- Cured-in-Place Lining

City's Standard Specifications and Details for Construction

The 1992 edition of the City of San Jose Standard Specifications and Details for Public Works Construction, issued by the Department of Public Works, identify minimum construction standards and specifications for the installation of new sanitary sewer systems and for the rehabilitation and repair of existing sewer systems.

Specifically, the specifications that directly relate to the sewer construction and rehabilitation are included in the "Drainage and Sewer Facilities" general provisions which includes the following sections:

- 1207. Pipe and Structures
- 1301. Trench Excavation, Bedding and Backfill
- 1302. Pipe Installation
- 1305. Pipeline Structures
- 1307. Acceptance Tests for Sanitary Sewers
- 1308. Cleaning Pipelines
- 1501. Sanitary Sewer Rehabilitation

For items which are not directly addressed, the City's Standard Specifications reference the current version of the American Public Works Association (APWA) Standard Specifications for Public Works Construction (Greenbook).

Standard drawings for manholes and lateral connections are included in the "Sewer/Drainage Structures", section of the City's Standard Details.

The complete City of San Jose Standard Specifications and Details are available at City's internet website in Adobe PDF format:

http://www.sanjoseca.gov/publicworks/details_specs/index.asp

These documents can also be purchased in book form from the Public Works staff at City Hall.

City's Contract and Technology Division of Public Works Department is in charge of the updating of the Standard Specifications and Details.

Standards for Inspection and Testing for New and Rehabilitated Facilities

City's Standard Specifications and Details

Inspection and testing of new and rehabilitated facilities is essential to ensure that the standards established in Section 7.a., "Standards for Installation, Rehabilitation and Repair" are adequately implemented in the field. The standards for inspection and testing of new and rehabilitated facilities are described in the following sections of the City's 1992 edition of the Standard Specifications (Standard Specifications) issued by the Department of Public Works:

- Section 1207, Pipe and Structures
- Section 1301, Trench Excavation, Bedding and Backfill
- Section 1302, Pipe Installation
- Section 1305, Pipeline Structures
- Section 1307, Acceptance Tests for Sanitary Sewers
- Section 1308, Cleaning Pipelines
- Section 1501, Sanitary Sewer Rehabilitation

Along with Standard Specifications, the Standard Details provides the "Sewer and Drainage Structures" Section for sewer facility construction.

Section 1307, "Acceptance Tests for Sanitary Sewers," provides specifications for sewers and force mains testing for leakage and deflection. The methods of testing specified in this section include:

- ***Air Pressure Test*** to determine watertight integrity for all sewers
- ***Hydrostatic Leakage Test*** to be used only when specifically ordered by the Engineer in writing
- ***Deflection Test*** to be required for flexible pipe sewers only
- ***Television Inspection*** to look for deficiencies such as joint separation, offset joints, cracked or damaged liner pipe, infiltration points, debris in sanitary sewer and liner installation

City requires all developers and design consultant to reference or use City's Standard Specifications as the minimum compliance standards in the design and construction of new, repaired and rehabilitated sewer projects.

Greenbook and ASTM Standards

When specification for certain construction or testing method is not provided in City's Standard Specifications, the project Special Provision will reference to the Greenbook and/or Caltrans Standard Specifications and ASTM standards with modified provisions that meet City's requirements. Each capital project has its own special provisions that include sections of material, installation of pipes and its appurtenances, inspection, testing and acceptance of work.

Inspection Guidelines

The City prepared the Construction Inspection Guidelines in March 1990 (First Edition). The Guidelines includes inspection guidelines in the following areas:

- Before construction: plan check, pre-job, material submittals
- Clearing and grubbing checklist
- Sewers: sanitary sewer project procedures and sewer inspection checklists
- Roadway, subgrade and base
- Concrete
- Utilities and electrical
- Paving
- After construction: punch list, final inspection and record drawings
- Contract change orders – forms and procedures
- Reporting and documentation

The Guidelines also provides checklists for sewer construction in these categories:

- General and preliminary dealing with permits, safety, traffic control, etc.
- Trenching
- Pipe laying
- Trench backfill and jetting (or compaction)
- Manholes and structures
- Miscellaneous and testing

Details of the guidelines and checklists can be found in the Appendix. The Guidelines will be updated when necessary. The Guidelines has not yet been officially adopted.

Construction Management

It is the City's duty to inspect materials and workmanship for all deviations from the drawings, specifications, and other contractor provision that may come to the City's notice. Project inspectors and engineers should have safe access to the work during its construction and inspect all work done and all material furnished. However, such inspection should not relieve contractor from any obligations to perform the work pursuant to the plans and specifications, even if defects or deficiencies in such work were noted or observed at the time of such inspection and not communicate to contractor.

City's construction management includes continuous onsite inspection. Inspections are performed during the progress of the work and at the completion of the construction. All acceptance testing for gravity sewers are performed in the presence of the project inspectors, and the sampling of liners are performed in the presence of and the testing performed by the third-party inspection and testing firms. The project will not be accepted until all results of the testing of sewers or liners meet the requirements of the project plans and specifications and/or established standards. When acceptance tests fail, the City requires contractors to submit repair plan for approval and conduct the repair per approved plan. Acceptance testing is then performed again until the testing results meet City's requirements.

For a CIP project, a full-time inspector is assigned to the project. For each development project, an inspector will follow the project until its acceptance. Inspectors are under Principle Construction Inspector's (PCI) and Engineer's supervision and direction, and should report any discrepancies directly to the PCI and the Engineer. All communications between the contractor and the Engineer are through the project Inspector.

Project inspectors are required to become familiar with the job plans and specifications, and approved contractor's submittals in order to assure that the work being inspected is constructed in accordance with the contract requirements. They should visit the job site and know the sewage pumping and diversion plan, and traffic control plan for each phase. They should be sufficiently experienced to note any material or portion of the work that does not conform to the requirements.

The inspector has the responsibility to be available at all times to provide prompt inspection, and a decision on acceptance when required. The inspectors maintain accurate and complete records and reports of all occurrences incident to the construction in the Daily Work Report. Any important deviation between design work and actual construction are noted and communicated with PCI and the Engineer. Inspectors will also witness field acceptance testing when performed by the contractor, applicator, or third-party inspection or testing firms.

Project inspectors can exercise the control in issuance of notices regarding violations or non-compliance with plans and specifications of the project, and in stopping work with consensus from the PCI and/or project engineers on any portion of the job if contractor's methods will result in defective work which would be impractical to correct or to replace subsequently.

The inspector will anticipate problems in advance of their occurrence and work with the contractor and the engineer to resolve issues and to avoid delay in work progress. The inspector recognizes unacceptable work in its early stages and notifies the contractor in writing if necessary. On issues related to deviations from the contractor requirements or may result in contractor change orders, the inspector should thoroughly investigate the situation and its possible consequences, and notify the PCI and the engineer before making decisions. Corrective work will be inspected.

The inspector will mark any changes to the design plans in his/her working plans. At the acceptance of a project, the inspector will provide the marked working plans to the engineer for the making of the "record-drawings" by updating all changes from the original plan drawings.